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KOPPERS

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The most efficient method of carbonizing coal is in KOPPERS OVENS and the best coke and by-products are produced by this process.

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1859 FIFTY-EIGHTH YEAR 1916

AMERICAN

GAS LIGHT JOURNAL

VOL. CV., No. 2. NEW YORK, JULY 10, 1916 WHOLE No. 3,044.

Introduction of Electromagnetic Separators Marked Increase in Quality and Quantity of Monazite Output

Mineral from Which Thorium, the Chief Constituent of Gas Mantles is Obtained, Occurs Most Abundantly in Coast Regions of Brazil—Cost of Mining Can be Lowered by Improving Present Inefficient Working Methods at Deposits.

By REGINALD GORDON

Three hundred million gas mantles are consumed each year. These, as ordinarily made, are composed of 99 per cent thorium. This is obtained from monazite, a mineral quite widely distributed, but most economically mined in the coastal regions of Brazil.

In the past considerable was produced in North and South Carolina, but, due principally to the small average percentage of monazite in the sands, lack of transportation facilities and inefficient working methods, these fields could not compete successfully with the foreign fields and have been generally abandoned.

The introduction of magnetic separators for extracting the monazite from the sands in the Brazilian fields has resulted in a considerably increased output both as to quality and as to quantity. Since 1894 the price of thorium nitrate has fallen from 2,000 francs per kilogram to 28.75 francs in 1915. Machinery is being substituted for human labor for excavating at the deposits, and it is likely that the substitution will become more general in the future with a further reduction in the cost of the output.

As is generally known, thorium, the chief constituent of gas mantles, is obtained from monazite, a mineral quite widely distributed, and commonly occurring in sand and gravel deposits. The coast regions of Brazil are at present our most abundant source of supply. Those minerals having as their chief ingredients the oxides of thorium, cerium, yttrium, zirconium and other elements occurring in very small quantities in nature are commonly designated by the name "rare earths." While not differing much from one another chemically, they are readily differentiated and distinguished by their spectra, which, of course, are characteristic. Being almost infusible, they are capable of emitting a brilliant light when raised to a high temperature. In gas mantle practice, this temperature is about 1,300 deg. Cent. Dr. Auer von Welsbach, as is well known, was the first to demonstrate that the addition of a very small proportion of cerium to a thorium mantle constituted the secret of the very high efficiency attained.

Norway Formerly Principal Source of Supply.

Up to the time of von Welsbach's work, the principal source of the mineral monazite, or phosphate of thorium, cerium, lanthanum and didymium was Norway, where it occurred in scattered deposits. There was also obtained thorite, the double hydrated silicate of thorium, calcium, iron, manganese, etc., usually containing more than 50 per cent of thorium; and orangite, a sesquihydrate of silica containing the same elements as thorite, but having a larger proportion of thorium oxide.

Monazite was discovered in Brazil in 1892, in the beach sands in the state of Bahia, and almost at the same time, in the states of Espirito, Santo and Rio Janeiro in similar localities. The discovery of the mineral in the interior soon followed in Minas Geraes and Parana. The deposits in the mountain region of North and South Carolina began to be worked about the same time, since when, this mineral so necessary for the manufacture of mantles has been found in almost every country in the world: Russia, Australia, Transvaal, the Dutch East Indies, as well as in Travancore in the southern part of British East India.

The Brazilian and Indian deposits are practically the only sources with which manufacturers have had to reckon in recent years, as the Carolina mines have been largely abandoned.

300,000,000 Mantles Consumed Every Year.

The world's annual consumption of monazite is estimated at about 3,500 tons, the thorium from which goes into the 300,000,000 mantles consumed every year, which, as ordinarily made, are composed of thorium, 99 per cent and cerium, 1 per cent. To make one mantle requires about 0.5 gram of thorium oxide ($Th\ O_2$),

Black Streak at Bottom of Bank is Monazite Sand.

Lake Being Lowered to Get Down to Monazite.

Loading Product at Beach for Shipment.

equivalent to 1 gram thorium nitrate. Most of the coarse sands contain from ½ of 1 per cent to as much as 30 to 40 per cent of monazite.

The first method of treatment, for beach sands as well as those of the interior was by washing, drying and sorting, both in Brazil and in the United States, but the quality of the output, as well as its quantity was much improved by the introduction of electro-magnetic separators taking all grades of sand and recovering not only monazite, but some marketable by-products as well.

Exploitation of Beach Sands Led to Abandonment of Interior Workings.

The exploitation of the beach sands in Brazil, as at Prado, in Bahia, and Guarapary, in Espirito Santo, furnishing monazite having a natural richness of from 50 to 60 and even 85 per cent, soon led to the abandonment of the workings in the interior. The first deposits were developed by an American engineer, acting for a firm in Hamburg, who secured very favorable contracts for the supply of the monazite sands extracted from the beaches.

Later, when it was discovered that these were under special restrictions by the Brazilian Government, the sands lying in the strip of land directly back of the beaches were leased under advantageous concessions.

Other companies soon began working the sands at Guarapary. Up to 1905, these concerns were the only exporters of the rare earths from Brazil, selling their product exclusively to the syndicate of German manufacturers known as the *Cartel* or Convention, which had a monopoly of the business of the salts of thorium and cerium. About the same time, however, French capitalists organized the Franco-Brazilian Mining & Industrial Society, for the purpose of acquiring and developing monazite deposits in Espirito Santo and Bahia, which immediately began the erection of factories in France for the treatment of the raw material and the manufacture of salts of the rare earths.

At first, this company had confined its operations to the rather low-grade deposits of the interior of the country, but, recognizing the advantages of those along the sea coast, began utilizing only the latter and soon built up a large industry.

One fact in particular, that led to the abandonment of the interior sand beds is that the nature of the country and lack of transportation facilities through the jungles and frequently flooded tracts of country rendered it impracticable to pursue the mining of inland deposits any longer. If, in the near future, the beach sands become exhausted, prospectors may again turn to the interior of Brazil, as well as to Argentina, where the river sands, though as yet but little exploited, are known to be rich in monazite.

The French company has been highly successful in competition with the others already in the field, holding its own against the stoutest efforts of its rivals to destroy its effectiveness, and having now a virtual monopoly of the Brazilian business. The accompanying illustrations are from photographs furnished by the Franco-Brazilian company, which in 1913 exported 1,628 metric tons of monazitic sand. The rather crude methods of treating beach sands shown is the same as that employed in North and South Carolina. There, the sand was usually dumped from wheel barrows into boxes or sluices having a perforated metal plate through which the heavy monazite, sometimes, along with gold-bearing sand passed, leaving the slime and tailings to be washed down to the farther end of the box.

Inconsistent Working Methods Caused Manufacturers To Forsake Domestic Supplies.

American manufacturers formerly secured their supply of thorium nitrate from the Carolina workings, but the unorganized, discontinuous methods of mining and marketing the product in the South, as well as the difficulty of lack of transportation led to the general abandonment of this source of supply. Furthermore, the average percentage of monazite of the Carolina sands was but little more than 0.25 of 1 per cent.

In Idaho and Colorado, on the other hand, monazite sands and gravels are worked chiefly for the gold they carry. Of all the rare earths obtained from monazite, thorium and cerium, of course, have the widest industrial application on account of the demand for mantle material. As mentioned in the American Gas Light Journal, Sept. 20, 1915, their preparation on a commercial scale is not a simple matter and some manufacturers are quite unwilling to disclose details of the processes they employ.

The magnetic separators employed in the Brazilian workings have required considerable modification in order to bring them to their present state of efficiency, but they do not yet separate and recover so large a proportion of the material treated as is desirable. In their development, it has been found necessary to employ several distinct sets of magnets, each having a different field strength to bring about the complete separation of those varying constituents of the material that have differing magnetic permeabilities. In practice, also, it has been found that no variation of the current strength is permissible, since it leads to lack of uniformity of the separated products.

Great Fall in Price Since 1894.

Thorium nitrate, which by reason of the high cost of the minerals of the rare earths, sold in 1894 for 2,000 francs per kilogram, fell in price as soon as the discovery of the Brazilian deposits was announced. In 1896 the price was 187.5 frances per kilogram, and it declined still further to 37.5 francs in 1899. Then, in May, 1904, the *Cartel* of German manufacturers raised the price to 66.25. In order to meet the German competition and attempted control of the market, the Franco-Brazilian Company referred to, secured the remission of the Government tax and was able to supply thorium direct to consumers free of import duty. In 1910, the price had fallen to 20 francs, but after that rose progressively until it reached 28.75 in July, 1915. In order to make the industry entirely independent of German manufacturers, the French company has recently made large additions to its establishments in France, where it is now turning out the whole series of the salts and oxides of the rare earths: Praseodymium, didymium, neodymium, yttrium, etc., and even mesothorium and other radio-active substances.

According to the Statistical Abstract of the United States, there were imported into the United States in 1914, monazite sand and thorite amounting to 1,102,300 lbs., valued at $52,329, a decrease from 1913 of 2,684 lbs. As a further evidence of the fall in price of the raw material for mantles, the same authority states that in 1911 the importation of monazite was valued at $215,700. The employment of hand labor almost exclusively has hindered the exploitation of monazite mining in the United States to a certain degree, in addition to which, in North and South Carolina, the beds were worked irregularly and usually by individual owners who were able to employ only a limited amount of help and who had little idea of commercial enterprise as applied to the development of the natural resources in their possession.

Magnetic Separator Treating Monazite Sand.

SANDS BEING WASHED—DRYING HOUSE SHOWN ON RIGHT.

Provided good transportation, either by land or water were available, it would seem that beach and river sands could be worked to especial advantage by employing machinery for excavation, transporting to the sluices and conveying to the dryers and separators, and, in the case of certain of the Brazilian deposits, this has been introduced on a limited scale, but considerable improvement may reasonably be expected in the future with a corresponding decrease in the cost of production.

Coke-Oven Gas the Joker Among the Cards in the By-Product Coke Man's Hand

Coke-oven gas is, in a way, the joker among the cards in the by-product coke man's hand, according to an opinion expressed by William H. Childs, president of the Barrett Company, at a recent meeting of the American Iron and Steel Institute. It may be worth a great deal for illuminating purposes, or it may be worth only its fuel value as against coal under steam boilers. In the first instance it brings from the consumer say about 60 cents per thousand cubic feet, or, allowing for purification and distribution, about 30 cents net. For fuel under boilers the usual price is about 4 cents per thousand, depending on the price of the coal it displaces. Modern coking practice easily recovers 6,000 cu. ft. of surplus gas per ton of coal carbonized. At 30 cents this would be $1.80 per ton of coal, as against a credit of 24 cents, which would be the other extreme.

Where a new plant is under consideration there is an ample reward here for wise planning and successful negotiation. Unfortunately, success in finding such a market for the gas is in many cases a difficult matter. For example, a modern plant of, say, 40 ovens, which is about the minimum and corresponds to a 400-ton furnace, would produce about 3¼ million feet of gas per day. This, under ordinary circumstances, would supply a city of at least 150,000 inhabitants.

Authentic reports are at hand which show a yield from a recent coke-oven plant of over 12,000 cu. ft. of gas per net ton of coal, containing less than 5½ per cent of carbonic acid and nitrogen. Of this gas less than 40 per cent of the heat value was used in coking, so that the surplus corresponded to 7,200 cu. ft. The coal was a mixture of 40 per cent low volatile and 60 per cent high volatile coal, which would average about 30 per cent volatile. The total amount of heat loss in waste gases and radiation at this plant was less than 4½ per cent of the total heat in the coal.

One important use, namely, for power development in gas engines, has not received the attention in this country that it has in Europe. So far as information is available, the only large gas engine installation using coke-oven gas in this country is at Lebanon, Pa., where four 1200-hp. engines using gas from the Semet-Solvay plant there develop electrical power for operating the Cornwall Ore Banks. According to published data, gas engines aggregating over 200,000 hp. for operation with coke-oven gas have been installed in Europe by three of the principal builders since the year 1904. A guarantee of 1 hp. per hour with 27 cu. ft. of average gas is not considered out of the way, which would mean about 200 hp.-hr. per ton of coal, or for each modern coke-oven the capacity to produce 125 hp. continuously, as long as it is in operation. A battery of eighty ovens would yield 10,000 hp.

Great Capital Outlay Would be Required to Establish Dye Industry in This Country

Cost of Plant, Labor and Material Much in Excess of Costs in Germany—Chemists Trained in Dye Producing Work Not Numerous in This Country.

The establishment of a profitable dye producing industry in this country would be beset with many difficulties. The costs of plant labor and materials are much greater here than in Germany and there is a scarcity of chemists trained in such work. Proper protective legislation would be essential to the life of the industry. These features were fully brought out in a paper presented by Capt. Fred H. Wagner, chief engineer of the Bartlett Hayward Company, in a paper presented to the Franklin Institute.

PATIENT SCIENTIFIC RESEARCH NECESSARY.

Realizing that industrial progress in the production of dyes meant commercial supremacy, the Germans quickly learned that success meant patient scientific research, combined with an adequate supply of raw material, with the result that by-product coke ovens were soon established in the immediate vicinity of their blast furnaces, where the distillation of the coal for the production of the necessary metallurgical coke soon supplied them with all of the by-products required in the development of the art.

The cost of producing dyes in the United States is said to be 44 per cent greater than in Germany, as it is estimated that the cost of a plant capable of producing 3,000,000 lb. of dyestuff per year would be $104,000 in this country and $70,000 in Germany, while the labor required would amount to $116,236 in the United States and $61,493 in Germany. The cost of material would be $443,000 in the United States and $317,000 in Germany. These comparative figures show a vast difference in favor of Germany, and the successful establishment of this industry in our country would require that protection in some form be given the American manufacturer in order to make up this discrepancy.

DISCREPANCY GREATER THAN FIGURES WOULD SEEM TO INDICATE.

The discrepancy is even greater than these figures would seem to indicate, because the German manufacturer has been in the habit of selling this country his surplus production, and that at a figure lower than the one paid by the domestic consumer. The establishment of this industry in the United States means opposition to the preeminent position of the Germans, whose success is based on a solid foundation of 30 years' standing, and which, therefore, becomes a standing challenge to our chemists and capitalists. We have the necessary raw material, and we possess constructive engineering ability of a character which can supply all of the needful apparatus, but, with all this, an almost unlimited capital and patience will be required.

But this is not all that is required, as chemists, trained in this particular work, are not numerous in this country, and their necessity is shown when it is mentioned that in one German works, producing about 500 colors, we find 300 chemists employed. Of these about 100 are engaged in analytical work, and the other 200 are in charge of the actual manufacture of the dyes, thus placing the production of only two or three colors under any one chemist.

NEEDED LEGISLATION.

After the capital has been supplied, and this new industry has been properly started, it will be necessary to secure proper legislation prohibiting "dumping" on our shores, a performance heretofore practised by the Germans, as well as a prohibition against an unfair restraint of our trade due to the arbitrary action of the German monopoly which is now allowed by foreign law, but not permitted by our own. Any scheme entered into must therefore necessarily depend upon an effective law which will prevent the control of our markets by foreign monopolies in the same manner as a domestic monopoly is now prohibited.

Advices received from Germany indicate that the German monopoly will re-enter the American market as soon as the war is over, and that it will make tremendous efforts to regain this lost business, being prepared to make extraordinary concessions in order to take the business from its infant competitors. It therefore is required of us that we place this new industry on a firm foundation as soon as possible, and that we seek such Federal legislation as will permit the continuance of the project without financial loss.

Petroleum Output in Appalachian Field in 1915, Five Per Cent Less Than in 1914

The output of petroleum in the Appalachian field, which includes New York, Pennsylvania, West Virginia, Kentucky and southeastern Ohio, was 22,860,048 barrels in 1915, according to figures compiled by the U. S. Geological Survey, a decrease of 1,241,000 barrels, or 5 per cent, from the output of this field in 1914.

The average price at the wells was $1.55 a barrel; and the total market value was 35,468,973, a decrease of 33 cents in average unit price and of $9,770,228, or 22 per cent in total value, from 1914.

Throughout the field as a whole, drilling activity, which generally reflects market conditions rather closely, was below the normal, though in certain areas there was abnormal activity resulting from the discovery that they were underlain by small pools of oil that had been overlooked in the earlier development of the region. A total of 5,197 wells were completed, of which 2,905, or 56 per cent, yielded oil, 1,254 were classed as gassers, and 1,038 were barren. The combined output for the first day of productive life of the oil wells completed in 1915 was 31,922 barrels, or an average of 11 barrels a well.

Scientific Organization of Science and the Technical Press

By A LONDON CORRESPONDENT

Since the outbreak of the war technical men in England have been steadily considering the organization of scientific resources, especially in regard to scientific and industrial research. While there are many scientific and technical societies in Great Britain of great influence and long-standing reputation, the war has shown that the services of men in the scientific professions has not yet been organized as fully as possible, and various steps have been taken to bring the manufacturers and scientific experts into closer touch, and to secure greater public appreciation of the value of applied science. A notable step in this direction has been the appointment of a Committee of the Privy Council on the Organization of Scientific and Industrial Research, which has already done good work by initiating special researches at various colleges and technical institutions, giving grants for experiments of industrial importance. Again the Royal Society recently called a conference of leading scientific societies with a view to forming a board of scientific societies, to act together in the interest of science and prevent overlapping of work.

All this shows that the scientific spirit is moving in England, and things in the future will certainly be very different from in the past. But it is recognized that an essential to complete success is to gain the public good will and to gradually educate manufacturers to appreciate what science can do for the industries. An important channel for the spread of information in this way is the scientific and technical press. There exists in London a body called the "Circle of Scientific, Technical and Trade Journalists" which has been energetically taking this matter up under the supervision of its chairman, Mr. L. Gaster, editor of The Illuminating Engineer. At recent meetings of the circle addresses have been made to the members by leading scientific men and representatives of the chief scientific and technical organizations, and resolutions have been passed acknowledging the great benefits of technical education and industrial research, and expressing the desire of the circle to take its part in disseminating information of industrial value amongst manufacturers and bringing about concerted effort among all interested in the organization of science.

It is recognized that journalists themselves need education on these matters but this movement is already bringing about results in this respect. An interesting event was a visit by members of the circle to the Imperial College of Science and Technology at South Kensington. The visitors were received by the Rt. Hon. Arthur Dyke Acland, chairman of the executive council of the college and addresses were given by leading professors, who described some of the special researches that have been undertaken since the outbreak of war, such as the study of the methods of overcoming the effects of poisonous gases used in the trenches, the sterilization of water supply for the troops, and the production at short notice of many chemicals and drugs hitherto made exclusively in Germany.

An address was also delivered before the circle by Mr. Gerald Lightfoot, who has come over from Australia in connection with the scheme for a National Institute of Science and Industry in that country. The proposed institute will be in touch with all the chief colleges and institutions in Australia, will give grants and create fellowships for research on subjects of national importance to that country, and will act as a centralizing body, preventing overlapping of work and organizing the scientific and technical resources of the Commonwealth.

Large Increase in Coke Production

The coke made in the United States in 1915 totals 41,581,150 short tons, an increase, as compared with 1914, of 7,025,236 tons, or 20 per cent; and was within 5,000,000 tons of the record output of 1913, according to figures compiled by the United States Geological Survey. Of this total, 34 per cent, or 14,072,895 tons, was by-product coke, and 66 per cent, or 27,508,255 tons, was made in beehive ovens. The increase in by-product coke over 1914 was 25 per cent, and of beehive, 18 per cent. An encouraging feature of the year's record was that the by-product coke made in 1915 is the greatest yet recorded, exceeding the output of 1913 by 1,358,195 tons. Three-fourths of the by-product plants reported an increase in output, and 4 new plants began production during the year—1 each at Cambria, Pa., Duluth, Minn., St. Louis, Mo., and Chattanooga, Tenn. The total number of by-product ovens in operation in 1915 was 5,481, against 5,142 in 1914. The number of beehive ovens in operation in 1915 was 49,540 as against 49,496 in 1914. The increase of 18 per cent in the production of beehive-coke from practically the same number of ovens indicates more continuous operation during the year. All states except Alabama, Georgia, Tennessee, Virginia, and West Virginia, in the south, and Massachusetts in the north, had increased output in 1915.

The production for 1915, by states, is summarized in the following table:

State	Beehive.	By-product.	Total.
Alabama	1,001,477	2,070,334	3,071,811
Colorado	670,938	.....	670,938
Georgia	20,039	.....	20,039
Illinois	.....	1,686,998	1,686,998
Indiana	.....	2,768,099	2,768,099
Kentucky	284,516	241,581	526,097
Maryland	.....	313,283	313,283
Minnesota	.....	127,847	127,847
New Mexico	389,411	.....	389,411
New York	.....	684,461	684,461
Ohio	19,101	665,557	684,658
Pennsylvania	22,530,567	3,092,295	25,622,862
Tennessee	233,705	23,268	256,973
Virginia	629,807	.....	629,807
West Virginia	1,250,235	141,211	1,391,446
Massachusetts, Michigan, Missouri, New Jersey, Utah, Washington, Wisconsin	478,459	2,257,961	2,736,420
Total	27,508,255	14,072,895	41,581,150

Over a Million Persons Employed in Industries Dependent on Coal-Gas By-Products

A large number of industries, representing a vast outlay of capital and employing over a million persons are dependent upon the use of coal-gas by-products for their successful operation. Capt. Fred H. Wagner, chief engineer of the Bartlett Hayward Company, in a paper presented at the Franklin Institute, listed the industries, the capital investments they represent, the numbers of persons they employ and the value of their products as follows:

Industry	Employees	Capital	Product
Textile	916,000	$1,814,000,000	$1,685,000,000
Leather	62,000	323,000,000	328,000,000
Paper	81,000	400,000,000	260,000,000
Paints and colors	30,000	250,000,000	

Thus it is determined that 1,089,000 persons are employed in the industries, there is a total capital investment of $2,814,000,000 and the annual product of the first three represents $2,273,000,000, in value. These figures are based on the 1909 census. When the increase in output during the intervening years is taken into consideration in conjunction with other manufacturers, such as producers of shoe dressings, writing and printing inks and etc., it would seem safe to estimate that at the present time fully 2,000,000 persons find employment in industries which are dependent upon dyestuffs for their success.

Output of Gas Manufactured in This Country in 1914 Exceeded That in 1909 By 52,894,308,000 Cubic Feet

Census Results Show Difference in Value of $53,423,410 Between Totals for 1914 and 1909—Output of Manufactured Gas Shows 31.5 Per Cent. Increase in Quantity and 26.3 Per Cent. Increase in Value—Oil Gas Production Increases 91.1 Per Cent. in Quantity.

A summary of the general results of the 1914 census of manufactures with respect to the gas industry has been issued by the U. S. Bureau of the Census consisting of a statement of the quantities and cost of the principal materials used, and the quantities and values of the products manufactured. The figures are preliminary and are subject to such change and correction as may become necessary upon further examination of the original reports.

Returns were received from 1,284 establishments in 1914, the total products of which for the year were valued at $220,237,781. Of these 1,284 establishments, 427 produced carbureted water gas; 274, straight coal gas; 156, mixed coal and water gas or mixed coal, water, and oil gas; 150, oil gas; and 165, acetylene. The principal product of the remaining establishments, 112 in number, was gasoline gas. The 150 oil-gas plants included 61 which manufactured Pintsch gas and 4 which produced Blau gas; and the 165 acetylene plants included 36 which distributed the gas in containers.

203,730,191,000 Cu. Ft. of Gas Produced.

The gas products comprise 203,730,191,000 cu. ft. of gas, valued at $175,065,930, consisting of 10,509,946,000 cu. ft. of straight coal gas, valued at $10,726,514; 90,017,725,000 cu. ft. of carbureted water gas, valued at $74,516,534; 86,281,339,000 cu. ft. of mixed coal and water gas, valued at $72,012,021; 16,601,805,000 cu. ft. of oil gas, valued at $15,044,509; 137,964,000 cu. ft. of acetylene, valued at $2,511,634; and 181,412,000 cu. ft. of other gas, chiefly if not entirely gasoline gas, valued at $254,718.

In addition, the gas plants produced for sale 114,091,753 bushels of coke, valued at $8,719,910; 125,938,607 gal. of tar, valued at $3,252,756; and ammonia liquors, ammonium sulphate, and hydrocarbons, valued at $1,405,540. They also sold "other products"—consisting largely of gas purchased for sale—to the value of $20,815,871.

Results of 1909 Census.

At the census of 1909 there were reported 1,296 establishments, with products valued at $166,814,371. Of this amount, $138,615,309 represented the value of 150,835,793,000 cu. ft. of gas; $5,723,215, the value of 82,049,683 bushels of coke; $1,875,549, the value of 78,339,880 gal. of tar; $770,211, the value of ammonia liquors and hydrocarbons, and $12,786,697, the value of other products.

The value of all products in 1914 was thus $53,423,410, or 32 per cent, more than in 1909; and the output of manufactured gas in 1914 exceeded that in 1909 by 52,894,308,000 cu. ft., or 35.1 per cent, in quantity and by $36,450,621, or 26.3 per cent, in value.

Big Increase in Oil Gas Production.

The statistics show increases for mixed coal and water gas, amounting to 111.6 per cent in quantity and 94.9 per cent in value; for carbureted water gas, 10.9 per cent in quantity and 5.2 per cent in value; for oil gas, 91.1 per cent in quantity and 24.2 per cent in value, and for acetylene, 447.8 per cent in quantity and 595.1 per cent in value.

On the other hand, the production of straight coal gas decreased by 47.4 per cent in quantity and 47.6 per cent in value; and that of "all other" (chiefly gasoline) gas fell off 16.3 per cent in quantity and 20.5 per cent in value.

The relatively large increase shown for oil gas is due chiefly to the increased production in the Pacific Coast states. The growth in the output of acetylene is attributable mainly to the increased distribution of this gas in containers, the 1914 figures including 115,511,000 cu. ft., valued at $2,192,328, or more than five-sixths of the total, distributed in this manner.

The decrease for straight coal gas is due to the fact that during the period between the two censuses many of the companies changed from straight coal gas to mixed coal and water or carbureted water gas.

In addition, there is a large amount of gas made in coke establishments, and used for illuminating and for domestic fuel. The gas purchased by the gas companies is largely retort coke-oven gas. The following tabular statement gives the by-products obtained in the manufacture of coke in retort ovens in 1909 and 1914, as reported by the Geological Survey:

	1914	1909
Gas: Cu. ft. (thousands)	61,364,375	15,791,220
Value	$6,009,583	$2,609,211
Tar: Gal.	109,901,315	60,126,006
Value	$2,867,274	$1,408,611
Ammonia, sulphate or reduced to equivalent in sulphate: Lb.	170,763,906	123,111,197
Value	$4,696,590	$3,227,316
Ammonia liquors: Gal.	5,938,233	.....
Value	$658,497	.....
Anhydrous Ammonia: Lb.	25,370,509	4,871,014
Value	$2,300,137	$448,455
Other by-products, value	$997,007	$380,355

Principal Materials Used.

The consumption of gas-making fuels by the gas companies comprised 6,116,672 tons of coal, costing $20,872,517, in 1914, as compared with 4,940,598 tons, costing $16,304,832, in 1909; 716,619,357 gal. of oil, costing $24,934,184, in 1914, as compared with 579,657,152 gal., costing $17,345,750, in 1909; 964,851 tons of coke, costing $4,706,602, in 1914, as compared with 591,919 tons, costing $2,667,706, in 1909; and 31,749,491 lbs. of calcium carbide, costing $778,037, in 1914, as compared with 6,080,465 lbs. costing $195,836, in 1909.

There was also purchased by the gas companies 28,351,074,000 cu. ft. of gas, at a cost of $8,883,016, in 1914, and 16,769,705,000 cu. ft., costing $5,416,601, in 1909, a part of which was enriched and sold, and the remainder sold as purchased.

To avoid duplication, the selling value of gas purchased and sold is included under "all other products" and neither its quantity nor its value enters into the figures for gas manufactured.

The cost of fuel purchased for boilers and retorts was $3,784,911 in 1914, as compared with $2,369,131 in 1909.

There were consumed, in 1914, 65,036,504 bushels of coke, 27,372,589 gal. of tar, 1,121,108,000 cu. ft. of gas, and 99,238 gal. of benzene or benzol, all of which was made in the establishments where consumed. The corresponding figures for 1909 are 49,550,153 bushels of coke, 31,590,178 gal. of tar, 1,730,563,000 cu. ft. of gas, and 302,994, gal. of benzene or benzol.

Increase in Mileage of Mains.

The mileage of mains increased from 45,119 in 1909 to 58,727 in 1914, or by 30.2 per cent.

There were reported 5,168,924 gas stoves and heaters in use in 1914, as compared with 3,603,435 in 1909, the increase being 43.4 per cent.

The number of gas stoves and heaters reported can not, however, be considered as representing the actual number in use, since the establishments reporting them in many instances say that their records show only those supplied by themselves and that they have no knowledge of the number obtained from other sources.

Of the 1,284 establishments reported for 1914, 131 were located in New York, 113 in Iowa, 99 in Pennsylvania, 75 in Illinois, 66 in California, 61 in Massachusetts, 60 in Indiana, 59 in Michigan, 48 in Nebraska, 47 each in Minnesota and Wisconsin, 43 in New Jersey, 35 in Missouri, 27 each in Connecticut and Texas, 25 in Ohio, 22 in Virginia, 20 in North Carolina, 19 in Georgia, 18 in Maryland, 17 each in Maine and South Dakota, 14 each in Alabama, Florida, and New Hampshire, 13 each in Kentucky and Washington, 12 each in Kansas, South Carolina, and Tennessee, 9 each in Arizona, North Dakota, Oregon, and Vermont, 8 each in Colorado, Delaware, and Mississippi, 6 each in Montana and Rhode Island, 5 each in Oklahoma and West Virginia, 4 each in Idaho, Louisiana, and Utah, 3 each in the District of Columbia and Nevada, 2 in New Mexico, and 1 each in Arkansas and Wyoming.

Great Opportunities Exist for Gas Makers in Industrial Fuel Field

Various Factors Enter Into Problem as to Whether or not Gas is Most Economical—Comparison of Costs Per Unit Measure of Fuels Does Not Alone Determine if Gas is a Possibility

By W. A. EILERS
Industrial Fuel Specialist
National Commercial Gas Association

Never before has there been such a great opportunity for the use of gas as a fuel than exists to-day. Yet the gas industry is receiving but a small percentage of the unprecedented industrial growth that the country is experiencing at the present time.

If the industrial activity of the gas companies is to have its proper growth the industry must realize that a greater development is necessary in the matter of constructing gas appliances, for there seems to be a growing need for larger units to meet this competition in the industrial fuel field. Much scientific skill must be given to this important branch of the industry, both as to the insulation of appliances and the application of the principles of combustion. We have much to learn from the electrical industry in this respect. Obtaining higher temperatures for certain classes of work, better combustion, and greater thermal efficiency are matters which should be given very serious attention not only by the manufacturer of gas appliances, but also by the gas companies as well.

High Cost of Oil Affords an Advantage

The advancing cost of fuel oil is giving every user of this commodity no small amount of anxiety, although many are inclined to be very optimistic about the matter, but, with the ever increasing demand and limited supply, it seems only reasonable to suppose that there is little chance for a return to the former low prices. Is our industrial development in gas appliances meeting the competition with other applications of fuel? It would seem not. One does not find standard gas appliances that will compare in size with the larger portable fuel oil furnaces.

If we are to correct this condition in the larger factories, we must act, and act immediately. When the industrial salesman goes into a factory and talks gas fuel to a man who is perhaps considering fuel oil in a large oven furnace, with a floor area of perhaps 3 ft. by 6 ft., he will have very little to offer him in the way of a standard appliance to meet his requirements. The great trouble with our industrial business to-day is "unpreparedness" to meet the competition in the industrial field. Granting that it is not practical to carry the larger sizes of ovens and other furnaces in stock, we should at least be prepared to offer information on standard equipment which could be built to meet the fuel oil competition we find in the larger industrial plants. This to my mind is one of the greatest handicaps in the development of the gas industry, and suggests a very important work for a central development bureau which seems so essential at this time.

All Fuel Requirements Not Possibilities.

All fuel requirements are not possibilities for manufactured gas. There are a number of operations which exclude its use at the present time. This may be due in many instances to a wide difference in the cost of the two competing fuels or to certain operating conditions. The existence of many large factories in a locality does not necessarily indicate the possibilities for industrial gas. There are many things to be considered in determining whether gas is practicable, of which the cost of the fuel is not always the governing factor.

The industries to which gas may be applied are of such a varied nature and there are so many local conditions affecting its adoption that it would be impossible to establish a working plan which would meet with success in all situations. Obviously the rate at which gas is sold has much to do with the successful development of this branch of the industry. Present signs seem to indicate that gas rates have a tendency to go lower while the cost of oil and other fuels is advancing, and with this reduction in the rates there must come a corresponding increase in business to the gas company in order to strike an even balance. The solution of this is in the proper development of the industrial fuel business in any city.

Necessity of Determining Total Cost Per Unit of Production

One if the great problems which has to do with the introduction of gas in many industries is to determine the total cost per unit of production and the amount of this which may be chargeable to the fuel. It is not so much the cost of a gallon of oil or a unit measure of the other fuels as compared with a cubic foot of gas that determines the possibility for gas. This is of primary importance, but what about the other items entering into the production cost? How much work is spoiled in the old method on account of poor control of the heats? How much faster can the work be turned out with gas? What about the cost of handling other fuels, such as unloading, storing, pumping, waste and office accounting? All of these items have a tremendous influence upon the actual unit cost of production. To illustrate this point, hard coal at $5.50 to $6.00 per ton was replaced by gas fuel at 80 cents per thousand for melting solder in large quantities for the manufacture of tin cans. Comparing the two fuels on a basis of heat units per unit of cost it would have seemed ridiculous to propose the adoption of gas. Yet this was done in one of the large cities with great success, due to the fact that the higher cost for gas was offset by a reduction in the cost of other materials and operations entering into the production of the cans.

Instance Cited

In one of the prosperous western towns a large manufacturer was preparing to move into a new factory and was on the verge of purchasing a large fuel oil equipment. The manager was not inclined to think that gas could be used as cheaply as oil on account of the great difference in cost, but it was demonstrated to him that automatically operated machinery for carbonizing large quantities of small steel pieces with gas fuel would not only be as economical as oil but the quantity production of the plant could be greatly increased.

This is a representative case of which there are many where a gas company has been losing out and where the very conditions of operation are ideal for gas fuel.

This is not likely to exist in our larger cities where an efficiently organized industrial department is covering the territory very thoroughly, but such conditions do exist in hundreds of smaller towns where little or no effort is made to get such business. This is largely due to the fact that gas company managers in the past have not realized the opportunities for marketing large quantities of industrial gas. Again the local field perhaps was not such as to warrant the continuous employment of an experienced industrial engineer. These facts together with varied and exacting responsibilities of the manager or superintendent, are in a way responsible for the neglect of this very important branch of the gas industry.

Service to Public

We have arrived at a period in the industrial development of our country where "service" counts for a great deal in the promotion of any great enterprise. People everywhere are willing to pay for service if it is administered in an efficient and businesslike manner. This fact is very clearly exemplified by the automobile industry and many other branches of industrial work.

It has been very well said, by a man prominent in the gas industry, in discussing the relation of a public service company with the public that "the very name of that class of corporation indicates clearly what it is expected to do—you have on one end 'public,' and on the other end 'corporation,' and the word 'service' ties the two together." Therefore I should prefer to look upon the industrial branch of our industry as that of "industrial fuel service," for if there is any field reached by the gas company where service has its true appreciation, it is with those engaged in an official capacity in the industrial activities of a city.

It requires as much and perhaps more intelligence at the present time to sell gas for manufacturing purposes than it does to make and distribute it. The cause of so many failures in gas fuel installations is no doubt largely due to a failure on the part of the management to realize this very important fact. The successful industrial salesman or engineer must not only know the limits of the product he is selling, but he must be thoroughly familiar with the possibilities of oil, gasoline, producer gas, coal, etc., as well as having a store of knowledge of the practical features of factory engineering and manufacturing in general.

Unit Cost of Production Big Factor

Replacing other fuels with gas in a factory comes down to a study of factory operating costs and striking a correct balance. Cleanliness and convenience are good talking points but they appeal very little to the average factory superintendent who is responsible for economy of operation. He is interested more par-

ticularly in the unit cost of production but apparently has little idea of the significance of the fuel costs which enter into the total unit cost. The problem for the industrial fuel representative is to analyze every operation in the plant which in any way involves the cost of the fuel he may be using, and he should not stop until he has traced every step from its arrival in the storage yard even including the purchasing agent's and bookkeeper's time. With one or two exceptions every operation, whether large or small, in any town, wherein fuel is used for heating operation, is a possibility for gas. Whether it is a prospect under the existing conditions remains to be determined.

The fundamental purpose of a gas company is to make, sell and distribute gas, and in this it is not unlike any other industry. Therefore it would seem that the same principles which apply to the marketing of large quantities of other material should also apply to gas. If central station electric plants using the same materials to generate their energy as those of private ownership, can, under high distribution and over-head charges, produce power so cheaply as to make it more economical for these plants to shut down and use central station current, why does not the same principle hold in the production of cheaper gas in large quantities?

Gas Coke Has Highest Domestic Fuel Efficiency

A series of tests made by the American Radiator Company to determine the efficiency of domestic fuels showed that gas coke of nut size led the list with an efficiency of 78.7 per cent, followed by gas coke of egg size with 75.43 per cent. Pittsburgh coke showed 71.40 per cent, anthracite coal 66.30 per cent and Pocahontas coal 66.10 per cent. It was also shown that in case of kindling Pocahontas coal stood first, but gas coke of nut size was a close second, followed by gas coke of egg size. Pittsburgh coke and anthracite coal were last.

Gas coke burns with an even, smokeless fire, it is easily controlled and clean to handle. It is also probably the most economical fuel in the market, and there is no reason why it should not displace many forms of domestic fuel now in use, thus greatly assisting in conserving the coal supply and adding benzol and toluol, with their subsequent products, to our source of national wealth.

Larger Oil Production Expected for 1916

The quantity of petroleum marketed in the United States during the first half of 1916 is estimated by the United States Geological Survey at 140,000,000 barrels. His apportionment of the output among the major fields is as follows:

Field	Barrels
Appalachian	11,400,000
Lima-Indiana	1,800,000
Illinois	7,900,000
Kansas and Oklahoma	50,500,000
Northern and Central Texas	4,200,000
Northwest Louisiana	6,800,000
Gulf Coast	11,400,000
Wyoming and Montana	2,400,000
California	43,500,000
Colorado, Michigan, and Missouri	100,000

This quantity, which includes a little oil actually produced in 1915 but marketed during 1916, is appreciably less than the output during the first half of 1915, though it is greater by about 5,000,000 barrels than one-half the entire quantity marketed last year. The magnitude of this quantity and the fact that it reflects the results of general activity throughout all oil-producing areas rather than flush production in restricted areas leads to the conclusion that the final statistics of oil marketed in 1916 are destined to establish a new record.

The outstanding feature of the petroleum industry during the half-year just closed was the high level reached in the prices of crude oil in March and maintained firmly to the end of the period. This level involves prices ranging from 90 to 350 per cent higher than those of a year ago for high-grade Eastern and Mid-Continent grades, and reflects the increased demand for crude oil resulting from the activity of a large number of new refineries installed during the recent period of low prices.

As a consequence of the incentive afforded by the high prices in the early part of 1916, activity in drilling increased enormously in all fields with the opening of spring, and, though within the half-year period no strictly new pools were discovered there was a development of old pools and new extensions that was attended with marked success.

Lighting Lecture Course Affords Splendid Opportunity for Gas Men

By H. THURSTON OWENS.

Men who have made lighting their life work are to be afforded an opportunity to review the developments of the past five years, and to obtain a much clearer understanding of the principles underlying the correct use of light in their homes and offices, as well as becoming better equipped to assist their employees and through them the public. The course of lectures to be held at the University of Pennsylvania, Philadelphia, Pa., Sept. 21-28, through the efforts and under the joint auspices of the Illuminating Engineering Society, has been designed and prepared especially to meet the needs of the managers, superintendents, or inspectors of the lighting departments of gas and electric companies.

Practical demonstrations of good and bad lighting backed by plenty of the ground work, by men who are leaders in the several branches will provide the answers to such questions as the following:

What color of light is the easiest on the eyes?
Is daylight the best quality of light?
Can you get daylight quality from artificial sources?
Are frosted lamps easier on the eyes than clear lamps?
Why should glass topped tables be used?
Why have many gas companies scrapped their upright arc lamps and replaced them with the inverted type?
What steps have been taken to standardize gas conditions similar to voltage regulation in electric plants?
From a standpoint of color value, what advantages have gas lamps?
What characteristics have our modern gas lamps that make them objectionable?
Why is it that a large percentage of the glassware used does not accomplish a useful purpose?
What inherent troubles with the older forms of gas lighting have been overcome?
What is the most important thing that has been done in the past two years to increase the gas lighting business?
Why do many merchants prefer gas to electricity for store front lighting?
How can a living room be lighted so as to please the whole family?

Many men of prominence and ability will be among the students and if the attendance comes up to the standard set at the previous lectures held in 1910 at the Johns Hopkins University, Baltimore, the lighting business will be greatly stimulated and better lighting will be increasingly in evidence.

Removal of Cyanogen From Coal Gas a Distinct Advantage in Operation

At present the removal of cyanogen from coal gas is a very profitable investment but, besides this, its removal is of a distinct advantage in operation, as its presence has a very deleterious effect on all steel work, and especially on gas-holder sheets. This fact was pointed out by Capt. Fred H. Wagner, chief engineer of the Bartlett-Hayward Company in a paper presented to the Franklin Institute.

The cyanogen in the gas may be removed either before or after the removal of the ammonia, the gas in the first case being washed with an iron solution with the consequent formation of ammonium ferrous-ferrocyanide, this being an insoluble product; while in the second case the gas is washed with a solution of hydrated lime and iron, this latter product being a soluble one. These products are generally converted into potassium ferrocyanide, commonly known as yellow prussiate of potash, or into sodium ferrocyanide.

Caustic Lime Increases Ammonia Yield

Many attempts have been made, mostly in gas retort practice, to increase the yield of ammonia from coal, in view of the large amount of nitrogen retained in the coke. The most promising of them, according to William H. Childs, president of the Barrett Company, in an address before the American Iron and Steel Institute, seems to be the mixing of a little less than 2 per cent of caustic lime with the coal to be carbonized. Results for a year at an English gas works showed a gain of 1.68 lb. of sulphate of ammonia per net ton of coal, the operations being benefited rather than otherwise.

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American Gas Light Journal Editor Resigns to Engage in Consulting Practice.

Sanford K. Campbell, after three years' service on the editorial staff of the AMERICAN GAS LIGHT JOURNAL, resigned, July 1, to engage in consulting practice, and has been succeeded in the office by Eugene C. Miles, formerly associate editor on the *Engineering Record*.

Mr. Campbell is a graduate in civil engineering from the University of Pennsylvania, and, previous to his connection with the AMERICAN GAS LIGHT JOURNAL, served in various capacities with the Northern Pacific Railroad, the Standard Oil Company, the Public Service Gas Company, at Paterson and Plainfield, N. J., and the Nassau & Suffolk Lighting Company, at Hempstead, L. I., N. Y. He was appointed associate editor on the staff of the AMERICAN GAS LIGHT JOURNAL, in April, 1913, and attained the editorship in May, 1914, upon the death of T. F. Cunningham, who was at that time editor.

Mr. Miles was graduated from Pennsylvania Military College in 1906, with a degree in civil engineering. From then until early in 1908, he served on the engineering forces of the Pennsylvania Railroad on the construction of the East River tunnels and the tunnel under Thirty-third Street in New York City. For about a year after this service he was employed by the Public Work Department of the Republic of Cuba on various engineering works in that island.

He returned from Cuba to become engineer for the Hanover Contracting Company of New York City, engaged principally in pipe line construction. In 1910 he went to Port au Prince, Haiti, on wharf construction for the Empire Engineering Corporation. Upon his return he again became connected with the Hanover Contracting Company, and continued in that service until the latter part of 1914. He joined the editorial staff of the *Engineering Record* in February, 1915, resigning, July 1, to accept the appointment as editor of the AMERICAN GAS LIGHT JOURNAL.

The Engineer and His Shell

Dissecting a dictionary is somewhat apart from the field of the gas engineer. Yet even in dictionaries there are to be found lessons which would be of value to him in his progress. We have heard a great deal within the past few years in regard to the engineer's coming out of his shell and demanding his place in public affairs, and we had begun to get the impression that he was doing so with encouraging success.

Within the past few days we had reason to glance through a recently published desk dictionary. While still under the "A's" we happened across what seemed to us an innovation. It appears that the publishers attempted, in addition to setting the community right in the matter of spellings, definitions and pronunciations, to list well-known persons and briefly outline what they represented.

After learning that Jane Addams was a social worker we looked up other names familiar in our daily life, and generally found them. Then it occurred to us to look up some engineers of such standing in the profession that their names instantly occurred to us. We started with that of the late Dr. Elmer C. Corthell. Much to our surprise and disappointment—so far as the dictionary went such a man might never have existed. We looked up several others with the same lack of success.

Miss Addams has accomplished some very useful work. She has earned a mention in the little dictionary. But Dr. Corthell also accomplished some exceedingly useful work of possibly a more practical value. In addition, among engineers and scientists, he had an international reputation and he was, at the time of his death,—since the dictionary went to press—the president of one of the great national engineering societies.

The comparison would not be so marked were the dictionary the output of some irresponsible and obscure publishing house and the product of an editorial staff of clerks and office boys instead of being, as it is, simply an abridgement of a standard dictionary in general use, which is edited by some of the most eminent scholars of the present day.

If these men did not think to include Dr. Corthell's name, and the names of some of those others which we looked up, it is evident that they did not consider that they would have the interest to the public that the names of social workers, popular authors, some of the more spectacular statesmen, etc., would have. By the omission they indicate more plainly than words that the engineer, despite his acknowledged merit and his undoubted right to a high place in the public thought and in public affairs, has signally failed as yet to attain his rightful place

The Gas Industry and National Service

It is gratifying to note the unstinting liberality the gas industry in general has shown towards those of its employees who have been called out in the national service. If any doubts were entertained as to the patriotism of American manufacturers in general, the developments of the past few weeks should effectually dispel them.

The total cost of keeping on full pay, without any productive return, the large number of workers who answered the call of the nation for service in the National Guard, and whose employers have announced such intentions, represents no insignificant amount, as will be strikingly shown in the net earnings reports at the end of the fiscal year. But industry did not falter or hesitate. The announcements came promptly and spontaneously.

As a result, the employees had at least one great anxiety removed from their minds as they turned their faces southward, towards what, none could or can yet tell.

Among the names of firms making such announcements the names of gas companies and operators appeared in pleasing numbers. The gas industry has shown forth well in the moment of national need.

Dye Production in the United States

Considerable interest is manifest in this country in regard to the production of dyes to so great an extent as to make us indeply of this commodity. Of timely interest, therefore, is the constructive analysis of the situation by Capt. Fred H. Wagner, which is reported on page 19 of this issue.

Though there is an undercurrent of optimism throughout his discussion and one, in reading, cannot but be convinced that in Captain Wagner's opinion such an industry will eventually be established on a large scale in this country, he does not minimize difficulties.

Contrary to the superficial beliefs absorbed by the layman from the columns of the daily press, the dye producers in this country have not, by far, rendered us even partially independent of Germany for our supply of dyestuffs. Nor, at the present rate of progress, will they have brought us to such a place in the next year or the year following.

Men do not invest vast sums of money in industries that can exist but for a short time. With our present laws still in effect, dye production could not be profitable in this country much beyond the continuance of the blockade of the German ports. Proper protective legislation is urgently needed. Those engaged in the manufacture of artificial gas should work the hardest to obtain the enactment of such legislation.

This accomplished, there will still be other obstacles to overcome, but these are technical problems that will be quickly solved if stimulated by the incentive that the passage of such legislation would furnish.

Cultivating the Public

The thought is not new that the public utility should seek in every legitimate manner practicable to culivate the friendship of the public it serves, but the necessity of speedily and generally putting the thought into practice was never more imperative than it is to-day.

The whole country seems at present to be on a rate-making spree. The spirit behind the movement is frankly expressed by a western city which recently advertised for a valuation engineer to look into the local gas and electric company's affairs "for the purpose of establishing lower rates."

Such an evaluation will naturally be unfair at the outset. Theorists tell us that evaluations are to determine if the earnings of the utility are reasonable, unreasonable or insufficient. There are two sides to the question. If the earnings are inadequate, then the rates are too low and an application to increase them should be granted. To do otherwise, provided it cannot be clearly proved that the low return is due to inefficient management of the utility, would be confiscation. If the profits are unreasonably high, then it is evident that the public is paying too much for its gas, its electricity or its water, and a reduction in rates would not be unreasonable. If the earnings are normal, then no change would be in order.

But an evaluation made with the avowed intention of lowering the rates, without any knowledge of their justice or reasonableness, is no evaluation at all—it is a grab!

Such a spirit indicates a hostile public, a public that has been taught to regard the utility as a grasping octopus, and which never thinks of the splendid intelligence, the industry and the efficient management that is constantly at work in catering to its comfort, convenience and safety.

For the existence of this public hostility the utilities are themselves in a large part to blame, not necessarily because of the offences they have committed, but rather in the advances and the efforts they have failed to make to acquaint their patrons with their side of controversies.

Had they, in the past, confined themselves a little less assiduously to the details of plant management and had gone out in the highways and byways of life and told the people the good they were doing half as assiduously as politicians and biased publicists were telling it of the opposite side, rate making would not be characterized by many of the downright injustices that we hear so much of to-day, for the simple reason that political capital could not be made so easily and cheaply at the expense of others.

For the Common Good.

As the larger cities become more congested it is inevitable that the available space for public utilities,—gas mains, water mains, electric ducts, sewers, drains, etc.—under the streets should become less and less until it is reduced to a minimum. It is but just, too, that the sub-surface structures of the municipality—since it is the owner of the space—should be given the preference and the right-of-way over the pipes and ducts of private companies. If, for example, in some street where in the past sub-surface structures were permitted to be installed in a haphazard manner without provision for future requirements, there should be a gas main zigzagging back and forth from curb to curb, and it should be desired by the city to install a new water main, it would not be unjust if the city authorities should order the gas company to rectify its alignment. To do otherwise would mean a great additional expense and an unreasonable extra burden on the shoulders of the taxpayer. But, unfortunately, municipal orders for gas main changes are not always, or even generally, based on such just grounds.

One case is known where a 20-inch gas main was laid along a street at a constant distance from the curb. The city water department let a contract for laying a water main of equal diameter along the same street. The plans the contractor bid on showed a center line parallel to the gas main and the curb, and not conflicting with the gas main alignment. But the location of the water-main line, as was the custom in that city, was very flexible and the contractor was permitted considerable latitude in choosing his alignment. As he had submitted an unbalanced bid with a cent a cubic yard on rock, which in this particular street lay about 2 feet below the surface, he naturally chose a line along the sewer manholes, where the rock had already been removed. This brought the water main in such a position that the gas main had to be moved at least a foot to make way for it. As can be imagined, the gas company protested energetically against this procedure. It did not, however, take any other steps in opposition to the alignment, and, when the water department backed up its contractor and insisted upon the order being obeyed, the shifting of the gas main was made.

On the face of it, it is evident that such an order was unjustified and unreasonable. When it is noted that the city did not save one cent by putting the gas company to the expense and inconvenience of moving its main, but, by enabling the contractor to reduce the quantity of rock he removed at a cent a cubic yard and thereby increase his earth excavation an equivalent yardage at a unit price of 90 cents, it actually caused itself and the taxpayer a greater expense. The gas company in this case, on its own account and for the common good of the industry, should not have been content with merely protesting. It should have taken legal steps, if necessary, and have spent sums out of all proportion to the amount saved in this particular case, rather than to have submitted to the injustice.

This case is perhaps an unusual one, and the injustice done exceptionally pronounced, but minor abuses of similar nature occur almost every day without number. It is the duty of the gas companies to guard their own interests; to insist upon and enforce just and reasonable treatment on the part of municipal authorities. The cost in individual cases may be much beyond the saving effected but in the end it will be returned many times over.

Prolific Waste in Production of Metallurgical Coke Almost Criminal

The late Prof. Vivian B. Lewes of England said: "Among the factors that lead to the commercial supremacy of a country, by far the most important is the command of fuel or other source of power, and England's position in the past has been governed largely by her coal fields, which in a little more than a century raised her to the forefront as a commercial power. The very abundance of our coal supplies was a source of weakness, as it led to outrageous waste, polluted our atmosphere to a criminal extent and so encouraged uneconomical methods of using it as to seriously deplete our available stock, the result of which has been the increase in price during the last few years and the certainty that the future will see further advances but no fall to the old rates. The day of cheap coal has gone, never to return."

This statement was quoted by Capt. Fred H. Wagner, chief engineer of the Bartlett Hayward Company, in a paper presented to the Franklin Institute, to emphasize the need of conserving our own coal supplies. "If this is true for England," he asked, "how much more so is it applicable to our own conditions, where so much remains to be done in conserving our fuel beds?"

This conservation can be greatly aided by a concerted effort to educate the user in the benefits to be derived from the burning of coke, but, here again, we find that in the manufacture of metallurgical coke the warning has not been heeded, and this industry in many instances exhibits a prolific waste which is almost criminal. The change from the bee-hive to the by-product oven is very slow, but it is progressing. We find that in 1893 the bee-hive ovens produced 9,464,730 short tons of coke, the by-product ovens producing only 12,850 tons during this same period. In 1901 the product was: bee-hive ovens, 20,615,983 tons; by-products ovens, 1,179,900 tons; in 1910, bee-hive ovens, 34,570,076 tons; by-product ovens, 7,138,734 tons, and in 1913 the bee-hive oven product amounted to 33,584,830 tons, while that from the by-product ovens was 12,714,700 tons. It is true that the total consumption of coke has increased, but, while that produced by the bee-hive ovens in 1893 amounted to 99.99 per cent of the total, this was decreased to 94.59 per cent in 1901, to 82.88 per cent in 1910 and to 72.54 per cent in 1913.

Modern Coal-Tar Dye Classification Divides Product in Eight Classes

Modern coal-tar dye classification divides the product into eight classes. These are: Acid dyes, tannin dyes, dye salts, sulphur dyes, vat dyes, mordant dyes, developing dyes, and albumen dyes. They were described as follows by Capt. Fred H. Wagner in a paper read before the Franklin Institute of Philadelphia:

The greater portion of the acid dyes consists of sodium salts of sulphonic acids, organic acids, or nitric acids, and they are represented by the azo dyes, the eosines, and picric acid. They are used principally for dyeing wool and silk, this material being dyed directly with the aid of an acid or an acid salt in the bath. Cotton is not dyed by these compounds.

Tannin dyes are also classed as basic dyes, consisting in large part of hydrochloric acid salts of color bases. If cotton is first treated with tannin we find that it is easily dyed, but we find that wool and silk can be dyed directly without the aid of this intermediate treatment.

Dye salts receive their names from the neutral or alkaline salts which are dissolved in the dye solution. They are also termed direct-cotton dyes and substantive cotton dyes, consisting usually of sodium salts of sulphonic or organic acids, the cotton fibre taking them up in this state. The dye-bath also receives some common salt or Glauber salt.

Sulphur dyes consist of a class of colors which are very popular owing to their cheapness and fast qualities. The bath is made alkaline with the soluble sulphides, the color being later developed by oxidation after the cotton material has been removed from the bath.

Vat dyes show but little attraction for the common fibres, and they are fixed on the material by reducing them to their leuco compounds in the vat. The material to be dyed is immersed in this reduced dye and thus becomes saturated with it, after which it is exposed to the air, where the color is developed by oxidation.

Mordant dyes are of a weak acid character. In order to cause their retention by the fibre, they must be converted into color lakes by means of a mordant, with which the fabric is impregnated, prior to treatment in the dye bath. The color known as Turkey red is an example of this class of dye, being made from alizarin, which is yellow and almost insoluble. The cotton fabric to be dyed is first treated with aluminium salts and Turkey red oil, then it is boiled in the alizarin, after which it is treated with calcium salt, the Turkey red color resulting.

Developing dyes, owing to their insolubility, cannot be applied directly to the fabric to be dyed, but are produced upon the fabric itself by saturating the latter with one soluble component and then immersing it in a second bath of another soluble component, the two uniting and forming an insoluble dyestuff.

Albumin dyes will not adhere of themselves, and they require that the fabric be first treated with some strongly adhesive substance, the principal substance used for this purpose being albumin.

Gas Company Emergency Truck Covers Entire Area of City of Chicago

Many lives have been saved, it is said, and heavy property losses have been averted since the installation of the motor emergency truck of the Peoples Gas Light & Coke Company, of the City of Chicago. The truck is a 1½-ton, 45 hp. White. It answers every fire alarm and goes to the assistance of victims of gas leaks, explosions, sewer and street cave-ins, asphyxiation, suicide, drowning, etc., and no charge is made for its service.

Truck is Subject to Call at Any Hour

The truck covers the entire city and is equipped with the most modern type of pulmotor for reviving unconscious victims, while the two attendants of the truck are experts in its use.

In answering fire calls it is the duty of the attendants to rush into the burning building, shut off the gas and electric connections and render such other assistance as it is possible for them to perform. Previous to its purchase the firemen were often perplexed in seeking the valves to shut off the gas at fires. The scope of the service is not limited to the property holdings of the company or the safe-guarding of its own employees, but includes also aid to the general public.

$26,000,000 Invested in Gas Works in Japan

Over 2,000,000 people in Japan now use gas for lighting purposes, and $26,000,000 are invested in plants and distribution systems in the country. Despite the fact that the charges are higher than in Europe and in this country the per capita consumption continues on the increase.

In time a more developed condition of the industry will permit of a lower rate through the production and sale of dyes, coal-tar and other by-products.

Superstition and ignorance were the causes of numerous accidents at first, but the results have not been so uniformly fatal as in many foreign countries. This is principally due to the fact that the rooms of Japanese houses are not so nearly air-tight as the houses of this country. There are about two hundred and fifty miles of piping.

The concerns engaged in the enterprise have, on the whole, done well from the standpoint of profit, the dividend yields being about ten per cent annually.

Boston Consolidated Makes Record Output

The Boston Consolidated Gas Company closed its fiscal year with a large gas output for June, and established a new high record for that month amounting to 398,503,000 cu. ft., an increase of 4.5 per cent, compared with corresponding month last year.

Massachusetts Gas Commission Considers Calorific Standard

Hold Hearing to Determine Upon the Number of British Thermal Units to be Required—Gas Companies Offer Use of Plants for Experiments

A hearing was held, June 20, by the Massachusetts Gas and Electric Light Commission under an act of the last Legislature, which provided for the establishment of a heat-value standard for gas, or the fixing of a number of British therminal units to be required. The act also calls for the experimental use of plants, as part of the board's inquiry.

Law Enacted Upon Recommendation of Board.

The law was enacted upon the recommendation of the board, after much consideration, and in the light of studies made by its inspection department of experiences elsewhere.

A. R. Weed, the chairman, stated that the board had not reached any definite conclusions, and that it was approaching the problem in a spirit of inquiry, satisfied of its importance to both the manufacturers and the users of gas in the commonwealth.

"For a number of years past," said Chairman Weed, "it has been increasingly evident that the candle power test is not thoroughly satisfactory or strictly scientific. The statute requires that during the test the gas shall be burned from the burner best adapted to it, which is at the same time suitable for domestic use. This requirement—and probably no other would be just—involves the use of burners still suitable for domestic use, but, by reason of changes in the art, no longer in actual use and not likely to be, since more efficient and economical burners are available.

"Furthermore, there has been a rapid increase in the use of mantle burners, whose efficiency in the interest of the consumer depends upon the heat value rather than on illuminating power, which is equally true of gas for heating and cooking.

"This means that the quality of gas expressed in terms of a candle power standard represents conditions less and less encountered in the actual use of gas at the present time and not necessarily conclusive of the gas delivered to customers.

Calorific Test Truly Scientific.

"A calorific test is, on the other hand, truly scientific and, if properly and carefully conducted, determines on a comparable basis the value to the customer of the gas supplied to him. Moreover, a series of tests conducted several years ago by the inspector developed what similar inquiries elsewhere have confirmed, that there is no fixed law with respect to the relation of the heat value and candle power

"Nevertheless, a series of tests by the inspectors, last year, of a considerable variety of gas throughout the state, made reasonably clear a workable minimum heat value for gas produced under existing practices. This same result has followed from similar investigations elsewhere, especially in New York, and by the U. S. Bureau of Standards. It is therefore possible to adopt a heat-value standard without much further investigation, which would insure the continuance of the quality of gas now supplied, even though the candle power test were abandoned.

"But the problem has seemed to the Board broader than the mere adoption of a heat value in connection with, and perhaps later, in substitution for, a candle power standard. The consumer pays for whatever is used in the production of the gas supplied. If he is paying for something which does not finally reach him, or if a large majority of consumers are paying for something which, in view of the use made by them, is of little or no value when delivered, then it may well be that a different quality of gas will be of more service, and that this difference may be defined in a calorific standard materially lower than one designed merely to continue present conditions.

Precedent Established in England and Canada.

"This has seemed to be the motive leading both England and Canada, not only to substitute heat value for candle power in gas testing, but to adopt a much lower minimum than has been undertaken in the very general movement towards a heat-value standard throughout this country."

Mr. Weed added that an attempt should be made to solve the broad problems preliminary to establishing any calorific standard. "It will be impracticable to do so merely by laboratory tests, and the board requested, and the Legislature granted a short suspension of the candle power tests for certain plants to be named for experiments in connection with the inquiry." This is to enable managers of such plants to operate without fear of penalty for deficient candle power, and for such purposes the board has fixed a tentative minimum of 500 B. T. U's.

"It follows as a matter of course," said Chairman Weed, "that if the candle power standard is suspended, and until a heat value has been determined, no penalty will result if this tentative minimum is not maintained, but the companies will appreciate that the whole value of the inquiry will be seriously impaired unless good faith and candor is observed."

Experiments To Cover 6-Month Period.

It is the plan to run the experiments from July 1 to Jan. 1, 1917, or later. The commission through its inspectors will keep in close touch with the plants named and daily reports will be required from managers. It is pointed out that reasonable changes in production methods should be made at the board's recommendation.

The manager of the Holyoke municipal plant, the Stone & Webster Management Association, and the Association of Massachusetts Gas Companies, through Albert E. Pillsbury, have put their plants at the board's disposal for tests.

One of the requirements of the act is the installation of calorimeters in plants of over 15,000,000 cu. ft. of gas per year. This is essential to the successful working out of the plan, as the apparatus is delicate and liable to injury if frequently transported. The board suggests the water-flow type, such as the Hinman-Jonkers, and will consider other types.

Mr. Wood, of the Boston Consolidated Gas Company, offered the use of that plant, and the co-operation of the company. Mr. Barnes, of the Cambridge Gas Light Company, C. H. Tenney, for the Springfield, Fitchburg and Malden and Melrose Companies, and Mr. Vittinghoff, for the Fall River and Haverhill Companies, under Stone and Webster management, likewise proffered aid and the use of the plants.

Two Radical Changes in Gas Business.

A letter from Dana D. Barnum, president of the Worcester Gas Light Company was read by Mr. Pillsbury. "During the past ten years two radical changes have been developing in our business," wrote Mr. Barnum. "First, the use of gas for illumination has decreased relatively within the past few years, due to the increased use of electricity for illumination." To offset this, the sale of gas for domestic and industrial fuel has increased very much, and, notwithstanding the fact that the gas sold for illumination is as large in volume as it was 10 years ago, the percentage thus sold is only about 35 per cent of the total, instead of 85 per cent, as 10 years ago. In order to offset the loss in the field of gas for illuminating, and to take care of the increased overhead expense which has come to most companies, it is necessary that gas companies develop the use of gas for fuel for all possible purposes.

"The sale of gas for fuel, for heating water and for cooking, has become important. In the last two or three years the development for industrial purposes has come on apace, and we also have the possibility of developing gas for heating houses

By-Products Give Coal Gas Advantage In Fuel Field.

"Second, the gradual, though fluctuating, increase in the price of oil has necessitated the development of the making of coal gas, and the European War has shown us from several directions that the manufacture of coal gas with the recovery of by-products is undoubtedly the most efficient and economical way of making gas for fuel. The by-products have become so valuable that, even at the old price of oil, it will still be possible to make coal gas at much less than carburetted water gas.

"One of the principal features is the fact that the hydrocarbons left in the gas are an extravagance and not to be desired from any point of view. These condensible hydrocarbons are valuable for making dye-stuffs, motor fuel and other uses. When left in the gas they make it necessary to adjust the secondary air in order to get proper combustion. They are the cause of trouble in Welsbach burners, due to the Bunsen burners becoming dirty therefrom.

FIRST REQUIREMENT IS TO MAKE GAS AT LOWEST POSSIBLE COST.

"The first requirement, (to meet electric lighting competition and gain large volume in output for fuel) is to make gas at the lowest possible cost. It is generally conceded that the heat units over 500 per cubic feet are obtained at a much higher cost per unit than the first 500, and that the last 50 or more heat units are obtained by leaving in the condensible hydrocarbons. We cannot say specifically that there will be a certain saving if we are to take these extra heat units out of the gas, but we do know that in a general way there would be definite savings and economies in the operation of the plant.

"The gas made in the past for illuminating has not been an ideal gas for that purpose. Strictly speaking, it contains several things that it should not, and, when considered as a fuel, there is all the more reason why it should be improved in order to compete with oil and hard coal.

"If a high test unit standard is set, as it has been for practically all the states, it will not be possible to prove the fundamental fact, viz: that it is possible to make gas at less cost per heat unit if the standard is not high, for the reason that no experimenting can be done.

"It may be argued that if the gas companies are allowed to operate under a comparatively low standard the saving should be divided with the consumers. Suppose a low standard is tried and there is some saving during the next one, two or three years; such saving will go but short distance toward offsetting the extra burdens due to increased wages, insurance, taxation, cost of oil, coal and practically every supply.

"The history of Massachusetts gas companies shows that when developments have benefitted the industry the gas consumers get their full share of the economies.

ISSUE A QUESTION OF QUALITY AND NOT OF COST.

Commissioner Schaff held that the real issue is the supply of the gas best suited to the purposes of a majority of customers, and not a question of cost.

The suggestion was offered that the tests should be extended through the winter months, in order to gain larger experience, under varying climatic conditions.

Mr. Pillsbury pointed out that the transition from the illuminating to the calorific standard is liable to cause disturbance, especially to users of open burners, and held that the board should urge upon the public the use of mantles. The chairman doubted the advisability of the board's undertaking any propaganda of a particular appliance.

Mr. Wrightington, of the Boston Consolidated, thought such propaganda should follow the definite establishment of the new standard. Otherwise it might call atention to a change not generally noticed, and suggest a reduction in light.

Captain McKay, of the same company, alluded to the work of the American Gas Institute, through its public works committee, and introduced Mr. Klumpp, its secretary.

Mr. Klumpp does not believe the change will bring difficulties; "Experience has taught," he declared, "that the change is all for the good." Probably 80 per cent of the consumers will never know that any has been made at all.

STANDARDS IN OTHER STATES.

In Pennsylvania there was no illuminating value standard, the companies manufacturing according to local requirements, at 16 to 22 candles. The change to heating value, in July 1914, set 535 units as the standard, except for Philadelphia.

The change in Massachusetts will bring little change in the methods of manufacture. Companies will not restrict their yields nor keep in condensible vapors to maintain candle power. These would be washed out and a uniform quality made throughout the year.

The illuminating value would vary summer and winter, due to the fact that with the same heating value, an illuminating value about 3 candles lower is obtained in winter than would be in summer. In some cases the service will better because there will be no change in the hydrocarbons.

In Milwaukee, where 8 candle power gas is now supplied, complaints have been reduced. There the heating value is uniform. The gas is a by-product, and scrubbed of its hydrocarbons. Formerly hydrocarbons were put in to keep up illuminating value.

Gas burns in efficiency in proportion to the heating value in nearly all plants. The amount necessary for combustion in a Bunsen burner is proportional to the heating power, and, if once adjusted for constant heating value, the efficiency of the light will remain the same. Companies should be allowed to make that product which is most economical in the long run, and give the best gas for the least money, with a fair profit.

HEATING VALUE REQUIREMENT SET TOO HIGH FOR ECONOMICAL OPERATION.

In Indianapolis the heating value requirement is set so high that economical methods cannot be used, and the commission has not enforced the regulation of late. The standard will probably be changed.

Mr. Klumpp urged that the Massachusetts standard should be such that companies may condense the hydrocarbons at the works and put out a uniform heating value so that they can adopt either straight coal gas or straight water gas, or a mixture of the two.

Wisconsin's standard is 600 units. The companies are carrying 580 to 600 as the monthly record.

It is probable that one or more hearings will be held before a calorific standard is set.

After the hearing, the Charlestown, Lowell and Old Colony companies offered their plants for experimental purposes.

Appreciation of the Worth of the Utility

It is but seldom that the general public looks upon a reduction in rates as anything more than a hard-fought victory wrung from a greedy adversary, which has, for many years, been exacting fabulous tribute from it. Seemingly, it has never been realized that it would not be possible for any gas company to lower its rates, and exist, had it not been for the intelligent studies in efficiency and economy in production that their officials have made and are still making.

The following extract, from an editorial commenting on the rate reductions in that city, appearing in a local newspaper, comes therefore as an agreeable surprise:

"The action of the Quincy Gas, Electric & Heating Company in voluntary offering to reduce its rates to gas and electric users is broadminded and farsighted. It will not only justly popularize the company among its consumers, but will strengthen the principle of private operation of public utilities throughout the country. The gas company, no doubt, has considered it wise policy to place gas and electric service within the reach of all, but *efficiency in management and manufacture have made the reduction possible.*"

Industrial Uses of Gas in New England

IN A LEATHER CHAIR SEAT FACTORY, at North Adams, Mass., a steam generator was installed a short time ago for the purpose of heating glue used in the manufacture of chair seats. It has been found so satisfactory and economical that a second unit is soon to be installed. These generators consume 6,000 to 10,000 cu. ft. of gas per month.

A BABY-CARRIAGE FACTORY at Leominster, Mass., makes a reed carriage. After the body is woven there are a large number of loose fibre ends or "threads" which work up on the reeds when being handled. These have to be singed off before the carriages are considered finished. Formerly, this work was done with a gasoline torch, but now gas in a blast burner performs this finishing process. The company's bill averages $24 a month for four burners.

AN ENAMEL WORKS in central Massachusetts has substituted a gas-fired oven for one using coal, to bake its enameled product. The average monthly consumption is something like 11,000 cu. ft. of gas.

A LARGE MACHINERY concern in the same section of the country is planning to install gas apparatus for metal hardening. Each furnace will consume about 300 cu. ft. per hour. At present 40 coal furnaces are in use.

A MANUFACTURER OF SARATOGA CHIPS in Western Massachusetts uses gas in his factory, the burner used consuming about 10,000 cu. ft. of gas a month.

ANOTHER CONCERN manufacturing ladies' braids has installed gas to replace a gasoline plant. The installation consists of a 3 hp. Kane steam boiler to serve two calendering machines used in finishing braids after they are dyed, and 16 gas burners used in singeing braid.

Publications

Gas Testing: The second edition of Circular 48, of the Bureau of Standards, on standard methods of gas testing, is now available. The volume comprises over 200 pages and gives all the data required for the installation, equipment, and operation of a gas testing laboratory.

The various types of apparatus are described, and their advantages discussed at some length..

Kinetic Arc Lamps: The new vertical kinetic burner outdoor arc lamps demonstrated at the Washington Show, by the Welsbach Company, are now being offered for sale. These lamps are made in 3 to 6 mantle sizes. The mixing chamber is reached through a hole in the bottom of the globe. The general appearance of the lamps is similar to earlier products of this company.

New York Commission Report 1915: The Second District; New York Public Service Commission has issued the first volume of its 1915 report. Of the 1,300 pages very few are given over to the operating end, the greater number dealing with orders. While they may be dry reading, those contemplating any business with the commission can get a very good idea as to what they can and cannot do, by reading the orders so carefully reproduced.

Lighting Handbook: In view of the approaching lectures on illuminating engineering the 1916 Handbook on Incandescent Lamp Illustration issued by the General Electric Company is very interesting.

This course, by the way, is not for the uninitiated and whether a man's bent be gas or electric he should have digested the great variety of data that this Vest-pocket Primer contains. It reflects great credit on the organization.

Tank Water Heater Prices: Most operating organizations tell the subsidiary companies what they must do, and the discussion on tank water heaters in the June bulletin of the United Gas & Electric Co. comes as a pleasant surprise.

The article first shows that the range installations outnumber the water heaters four to one, so that the additional business is not only available, but can be obtained without added investment. The closing paragraph is illuminating: "Won't it pay to put the price of tank water heaters within the reach of all?"

Employees Investment Plan: The June issue of the *Doherty News* includes a number of live news items and announcements, the one of greatest general interest having to do with a new investment plan which the Cities Service Company has offered to its 6,000 employees.

The company has set aside $3,600,000 of its capital stock, two-thirds preferred and the balance common, which is being offered to employees in amounts equal to one year's salary, which they will have five years to pay for.

French Gas Engineers Annual Meeting: The proceedings of the Annual Meeting of the "Syndicat Professionnel de L'Industrie du Gaz," held in Paris, France, on April 6, 1916, is now available for distribution.

Safety: We need to be admonished in order that we will not forget the precepts that are our guides towards physical well-being. Preaching safety without being monotonous is no easy task, and Mr. J. B. Douglas of the United Gas Improvement Company is to be congratulated on the success of his efforts in this direction. Safety News, now in its third year, has come to us each month with a message, presented in such an attractive and readable manner as to attract and hold our attention.

Commerce: A publication that is winning its way is known as *The Nation's Business.* It is published monthly by the Chamber of Commerce of the United States and contains short, digestible articles and editorials on American and Pan-American business.

A Voice from Peach Land: The soft wind from off Lake Michigan that brings the bloom to the peach has nurtured a new company booklet, issued by the Benton Harbor-St. Joseph Gas Company, called the *Teakettle.* It will be read by the woman, and that's all that advertising of this character is expected to accomplish.

A New Big Mantle Stove Unit: "And Still They Come!" is the title of a folder describing the newest member of the successful "Radio" family made by the General Gas Light Company. This Lamp will be known as the No. 10; and has the same structural features as the Radio-30 except that it is smaller and has only one big mantle. The porcelain interior, enamelled dome and one chain pull are retained.

Gas Distribution of Rochester, N. Y.: The Construction of Gas Distribution Systems by James Fahy, is one of the articles of interest in the June issue of the *Gas and Electric News* issued by the Rochester, N. Y., Company. Other items have to do with baseball, marriage, and preparedness.

American Gas Institute 1915 Proceedings

The papers, reports, discussions, etc., at the San Francisco meeting held last September, have been printed, bound and distributed to the members of the Institute. About one-quarter of the 600 pages is given over to the Constitution and list of membership.

The most lengthy and probably the most valuable of the reports is on refractory materials. That on supplying new buildings with gas, gives a synopsis of what such a report should cover.

The report of the Committee on Meter Connections is the first authoritative statement on this subject for a number of years and the thirty odd pages are made up of concrete suggestions and reports of what the committee felt was the best practice covering the several methods. The isometric drawings of piping are a great improvement over the old style plan and cross section type of illustration.

Speaking of the methods of handling the work of the Bureau of Information, the committee states that it has been unnecessarily slow, complicated and unsatisfactory in every way.

Artificial Dyestuffs Have Practically Displaced Those Formerly Used.

Artificial dyestuffs produced from the by-products of coal distillation have practically displaced those formerly used, such as natural indigo, cochineal, fustic, madder and many others. But American industries have always depended on Europe to supply the necessary materials. Statistics show that 80 per cent of our coal-tar dye requirements are imported from Europe, principally from Germany, the other 20% being produced by American manufacturers. But we have to look to Europe for our supply of the greater portion of the necessary intermediates, or raw products, before we can produce this 20 per cent of coloring matter.

Powers of Idaho Commission to be Strengthened

It is probable that the next Idaho Legislature will be called upon to materially strengthen the public utilities law of the state by the addition of a number of amendments placing back into it some of the propositions that the Senate withdrew when the measure was attacked by that body after it had passed the House as one of the strongest of public utilities acts.

One of these amendments will propose the clothing of the commission with power to order and direct the sale of public utilities where the service to a community is unsatisfactory and other parties are prepared to install a system that has all the necessary facilities to render good service. Several situations have arisen in the past two years where, had the commission had power to take this action, serious and costly situations would not have developed.

When the utilities act was before the Legislature that enacted it into law the Senate extracted from the measure a provision allowing commission supervision of securities of public service companies to prevent wild-catting and to see that the funds raised went into the property. It is claimed that the commission could have used this power during the past two years very effectively.

There is a more friendly sentiment over the state expressed toward the commission now than there has been since its creation. There were several attacks made on the commission during the last session of the Legislature, and one of these sought to repeal the law in its entirety. The Legislature, however, was not in that frame of mind. It is believed now that instead of attacking the law efforts will be made by many members of the Legislature to materially strengthen it through amendments.

Items of Interest from Various Localities.

Minimum Charge Held to Be Reasonable by Missouri Public Service Commission

Where it is shown that the cost of serving minimum resident consumers of electricity amounts to more than the minimum charge the minimum monthly bill is considered reasonable and is permissible, it was held by the Public Service Commission in its decision regarding the complaint against the minimum meter charge of the St. Joseph Railway, Light, Heat, & Power Company. All discrimination is not prohibited, it was pointed out by the commission, but only such discrimination as is unjust or unreasonable or gives an undue preference or advantage or an unreasonable prejudice or disadvantage. The law does not prevent the reasonable classification of electricity consumers, but permits placing in each of several classes all the consumers who are served alike and contemporaneously and under the same or substantially similar circumstances and conditions, and there is no unjust discrimination in classifying consumers and serving them under classified schedules of rates with sliding scales based more or less on the average cost of service to consumers in each class. Serving power consumers of electricity under regular schedules in lieu of special agreements was held to be in accordance with the provisions of the public service commission law, particularly as affects equitable rates.

Doherty Engineers Meet at Joplin

The annual meeting of the superintendents and engineers in the Southwestern properties, operated by Henry L. Doherty & Company, was held at the Connor Hotel in Joplin, Mo., June 21-24. Thirty-four delegates attended and addresses were made by George E. Hayler, general manager of the Empire District Electric Co.; W. G. Williams, construction engineer, of New York, and N. F. Paige. During their visit the delegates inspected the different sub-stations in the Empire District. Milan R. Bump, who returns to the Doherty Organization as chief engineer, addressed the delegates.

Rockford, Ill., Gas Property Valued at $2,237,211

According to the annual report of the Rockford Gas Light & Coke Company, filed with the state utility commission, for the period ending June 30, last year, the company is capitalized at $300,000 and is valued at $2,237,211.35.

In contradiction of a newspaper statement that the company earned a profit of almost 20 per cent during the year, Henry S. Whipple, manager of the company, called attention to the fact that while such an earning was made on the capital stock, the profits on the money actually invested in the property amounted to only 3 per cent.

To Attempt To Force Gas Price Cuts on Long Island, New York

The New York Public Service Commission has directed its counsel to begin proceedings against the Newton Gas Company, operating in the Second Ward of the Borough of Queens, New York City, for failing to obey the commission's order of May 25, requiring the company to reduce the price of gas from $1 a thousand cubic feet to 85 cents.

At the same time the commission directed that similar proceedings be started against the Woodhaven Gas Light Company, the Richmond Hill & Queens County Gas Company and the Jamaica Gas Light Company for having failed to reduce the price to 95 cents a thousand cubic feet.

The Brooklyn Borough Gas Company served a summons, July 6, upon the commission for the purpose of contesting the 80 cent gas law, passed at the last session of the Legislature, which affects that company and the Kings County Lighting Company. The matter will be argued in the Supreme Court on July 11.

The commission's counsel will take steps to compel the companies to keep on hand, ready for distribution, enough money to reimburse patrons in case the courts should eventually decide in favor of the lower rates.

Withdraws Proposition to Furnish Natural Gas to Baltimore

The Columbia Gas Company has withdrawn its proposition to furnish natural gas to Baltimore, Md. According to W. Y. Cartwright, Vice-President of the Columbia Gas Company, Baltimore city authorities sought to impose too heavy a tax on the corporation.

Kalamazoo Considering New Gas Ordinance

A meeting of the City Council of Kalamazoo, Mich., was held June 29, to discuss the proposed new city gas ordinance. The ordinance will cover the price and quality of gas manufactured and sold in Kalamazoo, the methods of extension, and the general duties of the company. It will provide for at least 75-cent gas, and insist that it must test 600 B. T. U.'s daily.

Rates Reduced in Indiana

The gas rates at Lafayette and West Lafayette, Ind., has been reduced from $1.10 to 90 cents per 1,000 cubic feet by the Northern Indiana Gas & Electric Company, the new owners of the property.

Societies and Associations

The Michigan Gas Association executive and entertainment committee held a meeting in Detroit, June 16, for the purpose of completing arrangements for the Fall Meeting to be held on Sept. 22. The following were present: Berton Laraway, J. T. Young, Glenn Chamberlain, Clark R. Graves, Richard Fowler, Harry Schall, Homer Eaton, A. Moran, A. L. Wilkinson, and W. J. Hill, representing L. B. Young. Final arrangements were made for the members and general arrangements for the guests at the convention, and a program was outlined in order to make it interesting from the social as well as the business standpoint. It is particularly desired that the members in general will make it a point to bring the ladies. The entertainment features include a trip on one of the Detroit River boats, including afternoon and evening with deck entertainment, dancing and supper and amusement for all. There has also been arranged for the ladies a trip by auto through Grosse Point, which is unsurpassed anywhere in the United States for scenery and beautiful homes, terminating at the magnificent Country Club for an afternoon tea and social session. This will be supervised by Detroit ladies. The Detroit City Gas Company has donated the service of their Saxophone band, which is an organization of twenty-five pieces constituted entirely of employees of The Detroit City Gas Company for the river trip.

The New England Section of the National Commercial Gas Association held its annual outing at Pemberton, on Saturday, June 24. The trip was made by boat from Boston, and dinner was served at the Pemberton Inn. Several employees of the Old Colony Gas Company attended.

The Lawrence (Mass.) Gas Company employees held their annual outing, June 21.

The Gloucester (Mass.) Gas Light Company employees were hosts to the Arlington Gas Light Company employees in an outing down the Annisquam River, June 17. A clam bake was a feature of the occasion.

Construction News

ELGIN, ILL.—Permission has been granted to the Western United Gas & Electric Company to construct a gas transmission line from Elgin to Bartlett by the State Public Utilities Commission. Permission was also granted to construct a gas distribution system in the latter city. The Bartlett Franchise, secured May 8, provides that work of laying pipe in the village shall be started by August 26. The company expects to start work on the transmission line, which will be constructed from the high pressure mains south of Elgin in a few weeks.

ELTON, ILL.—The Elton Gas & Electric Company is reported to be contemplating adding to equipment at plant at Belle Street.

GRETNA, LOUISIANA.—$40,000 will be expended in the construction and equipment of the gas plant and distribution system of the recently organized Gretna Gas Light & Fuel Company. The plant will be built on the river between McDonoghville and Gretna. Construction will begin in the early part of August. Harry O. Pennick, vice-president of the Jefferson Distilling & Denaturing Company is vice-president of the corporation. Louis F. Leonhard is general agent, and Felix Borden is manager. The capital stock of the company is distributed in 1,000 shares at $25 each.

BELMONT, MASS.—The Arlington Gas Light Company has been granted permission to lay a gas main in Linden Avenue.

CANTON, MASS.—People agitating for gas supply. Norwood Gas Company of Norwood, Mass., said to be investigating advisability of running the mains into the town.

FALL RIVER, MASS.—The Fall River Gas Works Company has been granted permission to lay gas mains in Centre Street from a point 250 ft. west of Broadway, westerly 100 ft. in Walker Street; from 360 ft. north of Hurst Street, northerly as far as the street is accepted, and in Cross Street from 150 ft. north of Fruit Street, northerly as far as the street is accepted; also across Hood Street at the intersection of Woodlawn.

NEWTON, MASS.—The Newton & Watertown Gas Light Company has been granted permission to lay mains in various streets.

Labor Conditions

Labor shortage is becoming more pronounced throughout the country each day that passes. The departure of many thousands to engage in the European War, the employment of other thousands in new industries consequent upon the war and our Mexican complications have affected every industry.

That an early peace in Europe would solve the difficulty is questionable. In view of the vast amount of reconstruction that must be accomplished there and the greatly reduced number of available men, it would seem that it may grow even more intense.

It may be possible to attract laborers to this country, but to do so will mean bidding almost prohibitive prices for their services.

There is but one solution that is evident, a solution that has already been adopted in part in the general construction field. The work of the machine must be substituted in every possible manner for that of man. Not only must this be the case in the large plant, but in the small plant as well—not only within the limits of the companies' properties, but outside of them also.

For deliveries and hauling, the motor truck will to a much greater extent supersede the horse, not only because the unit cost per ton mile of hauling in that manner in normal times is lower, but because of the lesser amount of human labor involved in transporting so many tons of material so many miles in that manner in these times of abnormal labor shortage. The automatic stoker must replace, to a greater extent, the grimy shoveler. In the field, the two and three-man pump for unwatering wet trenches has no place when efficient gasolene-operated pumps of the same type are obtainable. The use of the pneumatic hammer for calking is bitterly opposed by calkers' unions, and the quality of its work is not conceded by all to be on a par with that of the man with hand tools; but, perforce, calking in this manner will become more general.

The responsibility of the machinery manufacturer, and the gas engineer and plant superintendent are closely inter-related in the solution of the labor problem as applied to the gas field; the manufacturer to perfect his output and to introduce other devices hitherto unknown, and the gas man to be ever on the alert to discover new appliances that can be adapted to his work to save human labor, and, in the end, cut down operating expenses. There should be a closer co-operation. If, for instance, an engineer in the field has tried out the pneumatic hammer for calking and found it wanting in some respect he should not simply discard the tool and revert to hand calking, but should seek to discover why the tool failed and make his findings known. The discussions at association meetings are a good medium for making such facts public and the columns of this journal are always open to contributions of such a nature.

Propose Minimum Fixed Charge to Consumers

To care for its fixed charges, the Martinsburg Gas Company, of Martinsburg, W. Va., has proposed a fixed minimum charge per month on each meter. Should this proposition be accepted, the company will make a general reduction in rates on a sliding scale.

May Cut Rates to Obtain B. T. U. Test

Negotiations have been underway during the past two months between officials of the City of St. Louis and the Laclede Gas Company, which may result in a reduction in rates to consumers on the part of the company, and an adoption of the B. T. U. test for gas by the city.

Several months ago the gas company applied for permission to use the B. T. U. test for the company's product, stating that, at present, 96 per cent of the business was in gas used for heating purposes. The gas company would save about $70,000 a year in production under the new system, it is stated.

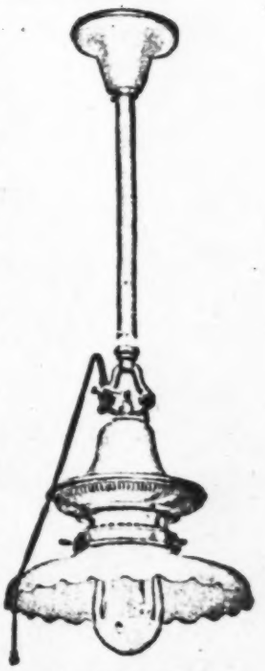
A committee composed of gas company officials: C. L. Holman, president; Charles A. Houts, attorney, and George B. Evans, chief engineer, and representatives of the city, have been in conference many times during the past few months attempting to agree on new rates.

The proposition of the city is a reduction of the present rates of 80 cents per thousand cubic feet for the first 10,000 to 75 cents per thousand for the first 2,000, and a reduction from 60 cents to 55 cents for gas in excess of the primary rate.

A New Lamp in the Radio-Series.

A new lighting unit in the Radio-Series line, manufactured by the General Gas Light Company, has just been announced. It is a single, "Big Mantle" unit called the "Radio-10," midway in size between the Radio-30 and the Radio-X; and it provides a complete system of illumination, an appropriate equipment for any service. It means that with these three Radio-Series units the gas man has three sizes of lamps that are identical in appearance and in operation—a harmonious system that will care for every corner of the biggest or the smallest installation.

The New Humphrey Radio-10 embodies all the original features of Radio-Series construction, design and operation that have so revolutionized conditions in the gas lighting field. It is in fact a reconstruction of the successful and popular Humphrey No. 10 Gas Arc to conform to the standards of the Radio-Series system. It contains the solid porcelain burner, the single-pull-chain valve and blue flame pilot first introduced in the Radio. X. The dome, stem and canopy are finished in porcelain enamel as in the companion units.



NEW RADIO UNIT

The Radio-10 carries the standard No. 400 mantle and all standard glassware, but special reflectors in white enamel and in the General Gas Light Company's "Diffuso" glass provide an equipment sufficient for all conditions of service. As with the Radio-30, the standard finish is brass-green enamel and brush brass, or white enamel and nickel plate is furnished. This latter provides a "sanitary" unit particularly appealing for the lighting of hospitals, kitchens, dairy lunch rooms and the like.

Financial Notes.

THE UNITED GAS & ELECTRIC CORPORATION reports the consolidated earnings of subsidiaries as follows:

12 months	1916	1915	Increase
Gross	$14,231,823	$13,180,559	$1,051,264
Net of taxes	6,321,746	5,532,260	789,196
Fixed charges	3,449,360	3,338,087	111,273
Surplus	2,872,386	2,194,271	678,115

The income of the corporation from all sources, after deduction of expenses for year ended May 31, was $1,461,728, from which was charged $183,926 interest on bonds, $43,695 amortization of debt discount, and $649,936 for dividends on first preferred stock, leaving a surplus of $284,171.

THE PACIFIC GAS & ELECTRIC COMPANY reports the following earnings:

From Jan. 1:			
Gross	*$7,821,983	*$7,749,538	†$ 72,445
Net	3,470,655	3,530,658	60,003
Surplus	1,777,920	1,719,263	†58,656

*Includes $157,347 in dispute account of rate litigation in 1916, and $164,301 in 1915.

†Decrease.

THE STONE & WEBSTER PROPERTIES showed the following earnings during May:

	1916	1915	Increase
Fall River Gas Works:			
Gross	$43,983	$43,281	$ 702
Net	14,720	17,678	2,958
Blackstone Valley Gas & Electric:			
Gross	135,948	116,005	19,943
Net	52,993	45,996	6,997
Haverhill Gas Light:			
Gross	20,080	19,749	331
Net	5,248	5,336	88

THE PACIFIC GAS & ELECTRIC COMPANY gained an additional revenue of $41,047.43 last year, due to the Panama-Pacific Exposition. Excluding this return the company has earned an increased revenue during May of this year to the extent of $10,487.34. The total operating revenue for the month was $1,457,458.16. The total expenses show an increase of $20,370.90. These amounted to $880,796.57. The surplus, after interest and other deductions, was $270,423.71, against $313,933.39 in May, 1915. The company's gross operating revenue for 12 months ending May 31 was $18,602,746.65, an increase of $1,010,750.21 over the preceding 12 months. Total expenses were $10,790,065.84, an increase of $628,162.59. Surplus available for dividends after interest and other deductions was $4,271,422.66, a gain of $1,045,477.11, compared with the previous 12 months.

GAS & ELECTRIC SECURITIES COMPANY, on the 7 per cent cumulative preferred stock of which dividends were deferred Aug. 1, 1914, paid a cash dividend of 14 per cent, July 1, to holders of record June 15, this constituting full payment of preferred accumulated dividends to date. The company will thereafter pay 7/12 per cent on the first of each month to preferred stockholders of record on the fifteenth of the preceding month. They will pay a dividend of 12 per cent in cash upon the common stock, July 1, to holders of record June 15.

GAS SECURITIES COMPANY, on the 6 per cent cumulative preferred stock of which dividends were deferred Aug. 1, 1914, will pay a cash dividend of 12 per cent July 1, to holders of record June 15, this constituting full payment of preferred accumulated dividends to date. The company will thereafter pay ½ per cent on the first of each month to preferred stockholders of record on the fifteenth of the preceding month.

GAS SECURITIES COMPANY will pay a dividend of 12 per cent in cash upon its common stock, July 1, to holders of record, June 15.

THE MASSACHUSETTS GAS COMPANIES have set aside from the earnings of the year just closing $1,250,000 for the payment of 5 per cent on the common stock during the ensuing fiscal year. Boston Consolidated Gas has declared a quarterly dividend of 2½ per cent, making 8½ per cent for the year or the same as last year. New England Coal & Coke pays 20 per cent which is the same as last year, and Boston Tow Boat pays 12 per cent. For the quarter, Citizens Gas of Quincy paid ½ per cent as compared with 1 per cent last year. Newton and Watertown 2½ per cent and 2 per cent extra as compared with 2½ per cent and East Boston paid 2½ per cent as compared with 2½ per cent and 1 per cent extra last year. The combined surplus for dividends of the system in May were $267,648 as compared with $230,759 in 1915, an increase of $36,889. This is the largest profit ever earned in May. The gas companies showed an increase of $2,082 and the coal companies an increase of $34,807. For the 11 months to May 31, the earnings were $2,593,891 as compared with $2,422,218, an increase of $171,673. Gas earnings show an increase of $30,180 and coal earnings an increase of $140,493. The following table shows the combined surplus for dividends of the subsidiary companies for May and 11 months since earnings have been reported:

	May	11 mos.
1907	$147,395	$1,169,771
1908	128,271	1,668,705
1909	151,180	1,739,642
1910	186,563	2,041,384
1911	188,838	2,181,759
1912	193,656	2,188,528
1913	212,164	2,598,434
1914	218,502	2,332,997
1915	230,759	2,422,218
1916	267,648	2,593,891

THE PEOPLE'S LIGHTING, HEATING & POWER COMPANY of Barre, has applied to the Vermont public service commission for the right to mortgage its corporate property not to exceed $250,000, the net proceeds of the sale of $200,000 thereof be used to refund its existing 6 per cent first mortgage bonds, and also for the right to fund a part of its floating debt and make extensions and improvements to the property. The company also asks the right to increase its capital stock by issuing $50,000 cumulative preferred stock and, incidentally, to change the corporate name to "Barre Gas Company."

Current Prices of Public Utility Securities

American Gas Co	120	123
*American Gas & Electric	135	140
*American Gas & Electric pf	50	52
American Light & Traction	381	385
American Light & Traction pf	110½	112½
American Power & Light	67½	69½
American Power & Light pf	84	86
American Public Utilities	43	46
American Public Utilities pf	75	78
Atlantic P. & L. pf	92½	95
Cities Service	355	358
Cities Service pf	88½	89½
Colorado Power	24	26
Colorado Power pf	99½	101½
*Commonwealth Pr., Ry. & Lt.	64	66
*Commonwealth Pr., Ry. & Lt. pf	84	86
Denver Gas & Electric gen. 5s	97	99
Electric Bond Deposit pf	85	...
Electric Bond & Share pf	99½	100
Federal Light & Traction	11	14
Federal Light & Traction pf	46	50
Gas & Electric Securities	290	...
Gas & Electric Securities pf	97	102
Northern State Power	87½	89
Northern States Power pf	95½	97
Pacific Gas & Electric	58	60
Pacific Gas & Electric 1st pf	87	90
Republic Ry. & Light Co	37½	38½
Republic Ry. & Light Co. pf	74	77
*Standard Gas & Electric	15	16
*Standard Gas & Electric pf	40	41
Tennessee Ry., Light & Power	10	12
Tennessee Ry., Light & Power pf	50	52
Toledo Trac., Light & Power	52	54
Toledo Trac., Light & Power pf	86	87